eliwell

EFLEX Energy

Compact controller for central units

AIR CONDITIONING

msk 528

ADDENDUM

1. INTRODUCTION

1.1. How to use this manual

This manual uses the following conventions to highlight certain parts of the text:

Important	Information that users must be aware of to prevent any damage to the system or hazards for people, devices, data, etc. Users MUST read and take note of these sections.
Note	Indicates further information on the subject concerned that the user should take into account.
Tip	A suggestion that could help the user to understand and make better use of the information provided.
*, **, °, °°	Provides further specifications on an explanation provided previously.
Fig. 1, 1 - Fig. 1, etc.	Provides references to figures, details in figures, parts of the text. Figures are referred to using an abbreviation in bold (E.g. '**Fig.**') and a number identifying the reference (E.g. **Fig. 1**). For components inside figures, the references are given using a letter or number (E.g. **1 - Fig. 1**). References to parts of the text are given using the number and title of the relative chapters, sub-chapters, paragraphs and sub-paragraphs and page number.

1.2. Addendum msk 528

This document is an Addendum of Energy Flex User Manual 8MAx0228 msk 464*

and should be used as and Appendix.

All information provided in this paper are relevant to the only specific functionalities of SBA600 MSK 528

All missing information and /or related to both msk 464/528 are available on Energy Flex User Manual

**x= 0 IT, 1 EN, 2 FR, 3 ES, 5 DE*

1.3. msk 528 Functions

- Pump down in startup and shutdown
- 'vacuum' alarm
- 'dynamic' defrost

Full list of functionalities is available on Energy Flex User Manual

1.4. Disclaimer

2. WIRING DIAGRAMS

2.1. Wiring diagrams

Please refer to Electrical Connections chapter from Energy Flex msk 464 manual

2.2. SKP20 Terminal

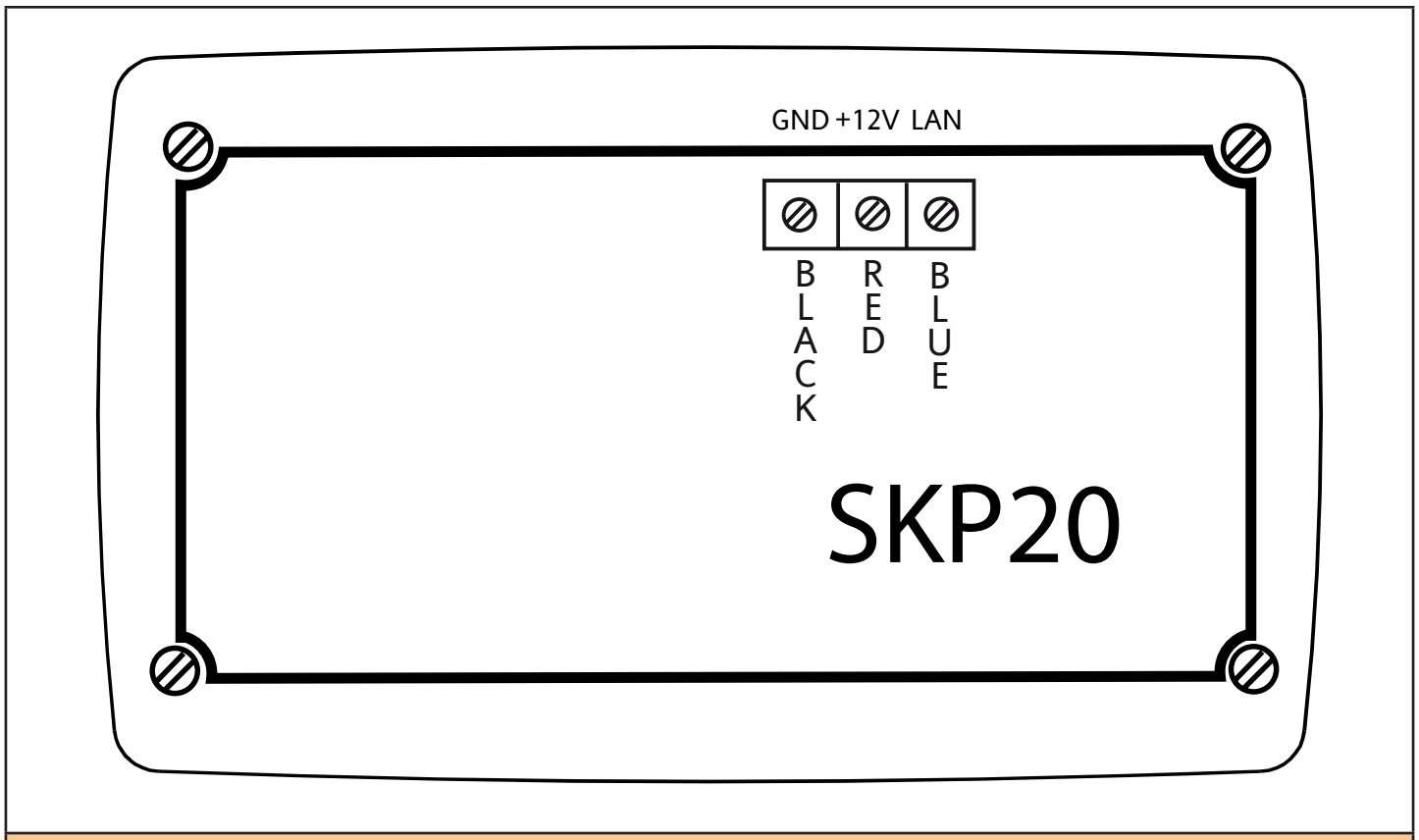

Fig. 1 SKP20 Terminal

2.3. SKP20 - Flex network

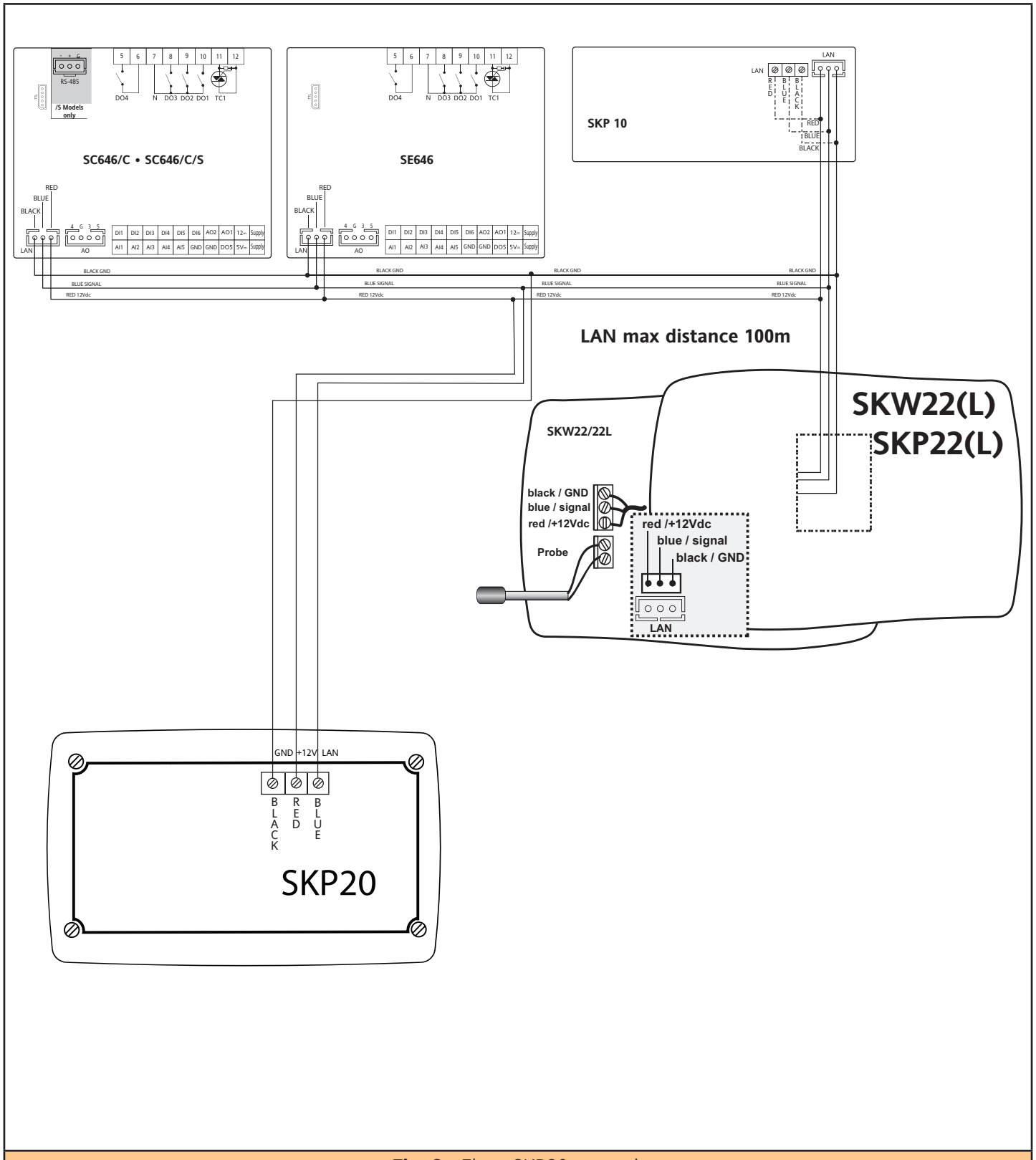

Fig. 2 Flex - SKP20 network

SKP20 and SKW22/SKP22 work in 'echo' mode. Both can be present in LAN newtwork.
Any change on SKW22/SKP22 has effect on SKP20 display and viceversa.

3. PHYSICAL I/O CONFIGURATION

3.1. Digital output configuration

See the section on Electric Connections available on Energy Flex user manual msk 464 for the number and capacity of relays/open collectors and for information on the symbols used on labels supplied with the device.

- High voltage outputs (relays) are identified as DO1, DO2, DO3, DO4 and DO6
- The low voltage (SELV), open collector output is called DO5

All digital outputs can be configured as outlined in the table below:

Parameter association - output configuration

	Value	Range	Description*	
CL90	DOL1 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CL91	DOL2 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CL92	DOL3 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CL93	DOL4 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CL94	DOL5 digital output configuration	-53...+53	See **Tab. 3**	Present in all models **(Open collector)**
CL95	DOL6 digital output configuration	-53...+53	See **Tab. 3**	Present in models with 5 relays
CL96	AOL1 digital output configuration	-53...+53	See **Tab. 3**	See Table A msk 464 manual- Analogue Outputs and Models (Applies if CL71=0, set CL80 appropriately)
CL97	AOL2 digital output configuration	-53...+53	See **Tab. 3**	See Table A msk 464 manual- Analogue Outputs and Models (Applies if CL72=0, set CL81 appropriately)
CE90	DOE1 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CE91	DOE2 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CE92	DOE3 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CE93	DOE4 digital output configuration	-53...+53	See **Tab. 3**	Present in all models
CE94	DOE5 digital output configuration	-53...+53	See **Tab. 3**	Present in all models **(Open collector)**
CE95	DOE5 digital output configuration	-53...+53	See **Tab. 3**	Present in models with 5 relays
CE96	AOE1 digital output configuration	-53...+53	See **Tab. 3**	See Table A msk 464 manual- Analogue Outputs and Models (Applies if CL71=0, set CL80 appropriately)

	Value	Range	Description*	
CE97	AOE2 digital output configuration	-53…+53	See **Tab. 3**	See Table A msk 464 manual – Analogue Outputs and Models (Applies if CL72=0, set CL81 appropriately)

Tab. 1 Parameter association - output configuration

**complete value list is available on Flex user manual msk 464*

If multiple outputs have been configured to run the same resource, these outputs will be activated in parallel.

Outputs: configuration table
Polarity is defined as indicated below:

	Value	Description
+	Positive	Active when contact closed
-	Negative	Active when contact open

Tab. 2 Digital outputs polarity

Valore	Description	Type
±7	Pump-down Valve circuit **1**	Digital
±8	Pump-down Valve circuit **2**	Digital

Tab. 3 Digital outputs configuration

If multiple outputs have been configured to run the same resource, these outputs will be activated in parallel.

4. MSK 528 FEATURES

Energy Flex **msk 528** is able to manage pump-down (on two refrigerant circuits).

4.1. Pump-down on start-up and during shutdown (PAR/CP FOLDER)

The pump-down system consists of unloading the evaporator before each stoppage of the last compressor in the circuit.
To achieve this aim, it is necessary to have a solenoid valve on the liquid line, which is able to completely intercept the refrigerant.
The solenoid valve is installed before the thermostatic expansion valve and is able to completely stop the flow of refrigerant.

The solenoid valve is controlled by the Energy Flex, one for each circuit.

msk 528 parameters

	Description	range	default	MU
CP33	Pump-down time during shutdown	0...999	0	sec
CP34	Pump-down interruption set-point	-50.0...99.9	2.0	bar
AL43	Low pressure alarm activation time from analogue input	0 ... 255	10	sec

Tab. 4 Pump Down parameters

msk 464 parameters involved

	Description	range	default	MU
St05	Reversal valve switching delay	0 ... 255	3	sec
St06	Reversal valve switching from Heat to Defrost delay	0 ... 255	15	sec
St07	Reversal valve switching from Defrost to Heat delay	0 ... 255	1	sec
AL44	Low pressure alarm regulator setpoint from analogue input	-500 ... 999	20	bar
AL45	Low pressure alarm regulator hysteresis from analogue input	1 ... 255	2.0	bar

Tab. 5 msk464 parameters

Enabling

The function is enabled if the parameter **CP33 - Pump-down time during shutdown** is different from 0

Digital outputs used

- **Circuit 1 pump-down valve**
- **Circuit 2 pump-down valve**

appropriately configured.

Before the last compressor in the circuit is shut down, the solenoid valve is activated (closed). The compressor remains active until the low pressure analogue input in the same circuit doesn't reach the Setpoint **CP34 - Pump-down interruption set-point**.

On the other case (analogue input non configured), compressor will remain active until the low pressure digital input is activated. On both cases the compressor cannot stay ON after maximum time defined by **CP33 - Pump-down time during shutdown.**

At the next request compressors of the circuit, the solenoid valve opens and begins the activation of the compressors when the analog input of low pressure exceeds the value **AL44 + AL45**. If the analog input is not configured, it starts the activation when the digital input of low pressure is deactivated. If the analog input of low pressure is already higher than the specified threshold or, in his absence, if the digital input of low pressure is already off, compressors activation starts simultaneously to the opening of the valve.

If the analog input does not exceed the specified threshold or, in the second case, if the digital input low pressure does not turn off, the compressor does not start and the unit produces a low pressure alarm (analog or digital) after a **CP33** time.

Notes:

- If an alarm is active, the procedure is ignored and the compressors shut down immediately.
- If the device is OFF, the procedure is ignored and the compressors shut down immediately.
- If the device is in standby mode, the pump-down during shutdown procedure occurs as normal.

During the pump-down phases, the digital and analogue low pressure alarms are ignored, for further details refer to the msk464 user manual.

Notes:

If the value of the parameters **St05/St06/St07** is different from 0, the pump-down during shutdown procedure does not occur:

- when passing from Heat mode to defrost, and on exiting defrost
- when passing to antifreeze with heat pump
- when changing mode

The alarms which deactivate the digital outputs **Circuit 1 pump-down valve** and **Circuit 2 pump-down valve** are the same alarms which deactivate the compressors in the given circuit.

Please Note. in the alarms table no distinction is made between compressors and valve in the same circuit.

4.2. EXTERNAL EXCHANGER FANS (PAR/FE FOLDER)

4.3. Fan control in defrost

Enable

Parameter	Description	Value
FE00	External exchanger fan mode selection	**0=Ventilation disabled** **1 =Continuous operation (Always ON)** **2 = Operation on call (ON when compressor ON)**

Fan activation in defrost mode is useful because pressure at the external exchanger can reach alarm levels if the exchanger is not totally de-iced. To prevent a high pressure alarm in this situation, the fans are run (at minimum speed if modulating).

The behaviour of the external exchanger fan during defrost is determined by **FE11- Enable special open system intercooler fan on**, in which the fans run at maximum speed.
If the machine has two temperature control circuits, the status of the fan is dependent on the defrost condition of its respective circuit.

On completion of defrosting the fan resumes operation as requested by its controller.

- If **FE11 = 0**, the fan is forced off throughout defrosting.
- If **FE11 = 1**, the fan is off or on at minimum speed (digital output active) depending on the analogue input configured for control of the fan in defrost and parameter **FE12 -External exchanger fan on setpoint in defrost** in the following way:

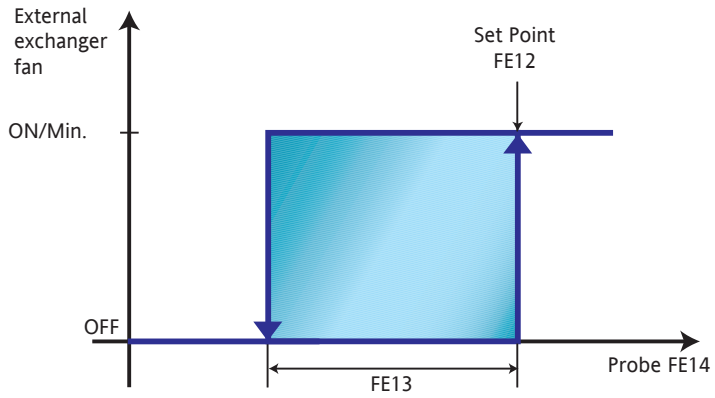

Fig. 3 Fan defrost control graph

Parameter	Description	Notes
FE12	External exchanger fan on setpoint in defrost	**Set-Point**
FE13	External exchanger fan on hysteresis in defrost	**Hysteresis**
FE14	Select probe for external exchanger fan regulation in defrost	**Regulation probe** **0 = No probe** **1 =External exchanger temperature (circuit 1 and 2)** **2 =High pressure input (circuit 1 and 2)** **3 =External exchanger pressure (circuit 1 and 2)**

MSK 528 features : Defrost Fan speed (external exchanger fan)

FE30 - Minimum speed external exchanger fan in Cool
FE32 - Maximum speed external exchanger fan in Cool

Once the unit is reset the first time actually the minimum speed **FE30** is currently used.
If the defrost ends for timeout (**dF22 - Maximum defrost time**) the minimum speed **FE30** will be used as well.
If, however, the first defrost ends by reaching the temperature / pressure then in the next defrost the fan speed will be increased by an amount equal to ¼ of the difference between the two maximum and minimum speed (**FE32 - FE30**).

In the subsequent defrosting cycles, the fan speed defrost calculation will be:
- Each time the defrost will end up temperature. / Pressure, the speed will be increased by **(FE32 – FE30)/4**, up to a maximum corresponding to **FE32**;
- Each time the defrost will end, however, by duration, the speed will be decreased by **(FE32 – FE30)/4**, up to a minimum corresponding to **FE30**.

This method allows optimum defrosting of the heat exchanger, with the following settings:
- dF22 with the duration you set "ideal" / defrost waiting for complete defrosting
- end of defrost temperature / pressure situation is not common (not standard situation): this would not in fact have complete defrosting (eg for non-ideal positioning of the end defrost probe).

The described mechanism has the advantage of auto adapt quickly to environmental conditions and, moreover, does not require the processing of the historical data.

msk 464 parameters involved

	Description	range	default	M.U.
dF22	Maximum defrost time	1 ... 255	5	min
FE00	External exchanger fan mode selection	0 ... 2	1	num
FE12	External exchanger fan on setpoint in defrost	-500 ... 999	190	°C/Bar
FE13	External exchanger fan on hysteresis in defrost	1 ... 255	10	°C/Bar
FE14	Select probe for external exchanger fan regulation in defrost	0 ... 3	1	num
FE30	Minimum speed external exchanger fan in Cool	0 ... 100	50	%
FE32	Maxmum speed external exchanger fan in Cool	0 ... 100	100	%

Tab. 6 msk464 parameters

5. PARAMETERS (PAr)

The parameters can be set to fully control Energy Flex controller.

The parameters can be modified via:
- Multi Function Key (MFK);
- keys on the SKP20 (SKP10, SKW22) terminal;
- personal computer and Device Manager software.

Both parameters and folder visibility can be controlled (See Folder table). If folder visibility is modified, the new setting will apply to all parameters in the folder.

Levels of visibility

There are 4 levels of visibility that can be set by assigning appropriate values to each parameter in the folder, only via serial, software (DeviceManager or other communication SW) or programming key.

The visibility levels are:
- value 3 = parameter or folder always visible;
- value 2 = manufacturer level; these parameters can only be viewed by enter the manufacturer's password (see parameter Ui28) (all parameters specified as always visible, parameters visible at installer level and manufacturer level will be visible);
- value 1 = installer level; these parameters can only be viewed by enter the installation password (see parameter Ui27) (all parameters specified as always visible, and parameters visible at installer level will be visible);
- value 0 = parameter or folder NOT visible.

Parameters and/or folders with a level of visibility other than 3 (password-protected) will be visible only if the correct password is entered (installer or manufacturer) following this procedure.

Parameters and/or folders with a level of visibility =3 are always visible even without a password: in this case, the following procedure is not necessary.

5.1. Parameter table/visibility, display folder table and Client table

The tables below list all information required to read, write and decode all accessible resources in the device.

There are 3 tables:
- the parameter table lists all controller configuration parameters saved in the non-volatile memory, including visibility;
- the folder table lists all parameter folder visibility details;
- the client table includes all I/O and alarm status resources available in the volatile memory of the instrument.

5.1.1. Parameters / visibility table

FOLDER	LABEL	ADDR	DATA SIZE	CPL	EXP	VIS PAR ADDR	RESET (Y/N)	R/W	DESCRIPTION	RANGE	DEFAULT	M.U.
CP	CP33	17162	BYTE			49538		RW	Pump-down time during shutdown	0...999	0	sec
CP	CP34	17164	BYTE	Y	-1	49538,2		RW	Pump-down interruption set-point	-50.9...99.9	20	bar
AL	AL43	50613	BYTE			49618,4	Y	RW	Activation time of low pressure alarm from analog input	0 ... 255	10	sec
AL	AL58	50637	BYTE			49622,2	Y	RW	Activation time of vacuum alarm from analog input	0 ... 255	10	sec
AL	AL59	17870	BYTE	Y	-1	49622,4	N	RW	Setpoint of vacuum alarm regulator from analog input	-50.0 ... 99.9	20	bar
AL	AL60	17882	BYTE		-1	49622,6	N	RW	Hysteresis of vacuum alarm regulator from analog input	0.1 ... 25.5	20	bar

Tab. 7 Parameters / visibility

6. ALARMS

Energy Flex performs full installation diagnostics and reports a variety of alarms.

6.1. Low pressure digital alarms enabling

Low pressure digital alarm follows standard rules (see msk 464 user manual)

Moreover you can decide whter to activate it or not during defrost through **AL13 - Enable low pressure alarm during defrost**

Note. Low pressure digital alarm related to dedicated circuit is not active if Pump-down valve of the relevant circuit is active (valve closed, Pump-down ongoing, and after CP33 time after deactivation)

6.2. Digital Alarms table

Label	Descrption/Cause*	Bypass activation	Bypass
E005	**Circuit 1 digital low pressure alarm**	Circuit compressor activated or reversal of 4-way valve*	**AL11****
E006	**Circuit 2 digital low pressure alarm**	Circuit compressor activated or reversal of 4-way valve*	**AL11****

**The bypass is activated by the reversal of the 4-way valve only if at least one compressor is on*

***if CP33 is ≠ 0 (pump down enabled), bypass AL11 must be ≠ 0 .*

6.3. Analogue Alarms table

Alarm code	Description	Bypass activation event	Bypass time	SET activation	Hysteresis	Automatic alarm time	No. inter-ventions time	Control probe
E007	**Low pressure (analogue) circuit 1**	-	-	AL44	AL45	AL43	AL46	High pressure input circuit 1
E008	**Low pressure (analogue) circuit 2**	-	-	AL44	AL45	AL43	AL46	High pressure input circuit 2
E032	**"Vacuum" circuit 1**	-	-	AL59	AL60	AL58	manual reset	Low pressure input circuit 1
E033	**"Vacuum" circuit 2**	-	-	AL59	AL60	AL58	manual reset	Low pressure input circuit 2

6.4. Vacuum alarm

Enabling

An analogue input shall be set as "Low pressure input circuit 1". (value **23**)

For 2 circuit plants an analogue input shall be set as e "Low pressure input circuit 2". (value **24**)

General conditions of operation

Manual reset only.

The alarm is delayed by a time set by **AL58 - Activation time of low pressure alarm from analog input**, regardless of the compressors from power on (and / or the valve pump-down deactivation) of the specific circuit.

The activation is associated with the **AL59 - Setpoint of vacuum alarm regulator from analog input** and **AL60 - Hysteresis of vacuum alarm regulator from analog input**.

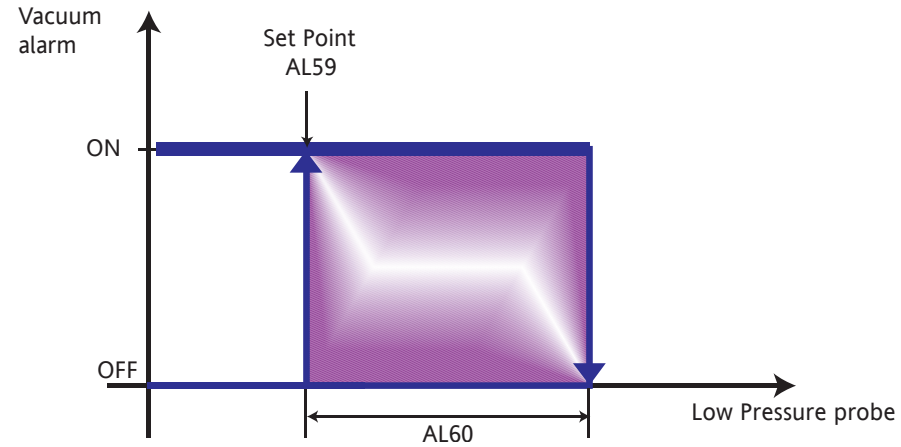

Fig. 4 Vacuum alarm graph

Notes.

If probe / probes are in error, unit will be blocked.

The vacuum alarm has the same effects of low pressure alarm, exclusively on the corresponding circuit.

Compared to the alarm low pressure, typically this alarm has lower setpoint and acts with different timing.

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